MECHANICALLY STABILIZED EARTH WALL FINE AGGREGATE SAMPLING AND TESTING PROCEDURES

Materials and Tests Unit

January 9, 2012

North Carolina Department of Transportation

1. SCOPE

1.1 The purpose of this manual is to provide a uniform procedure for obtaining fine aggregate samples used as backfill material for mechanically stabilized earth walls. This procedure does not pertain to coarse aggregate.

1.2 The manual also describes the tests required on the backfill material.

2. REFERENCED DOCUMENTS

2.1 North Carolina Department of Transportation *Standard Specifications for Roads and Structures*.

2.2 North Carolina Department of Transportation Policy for Mechanically Stabilized Earth Retaining Walls

2.3 NCDOT Standard MSE Retaining Walls Provision

2.4 AASHTO Standards:

- Section 7.3.6.3, LRFD Bridge Construction Specifications
- T104, Standard Method of Test for Soundness of Aggregate by Use of Sodium Sulfate
- T112, Standard Method of Test for Clay Lumps and Friable Particles in Aggregate
- T267, Standard Method of Test for Determination of Organic Content in Soils by Loss on Ignition
- T288, Standard Method of Test for Determining Minimum Laboratory Soil Resistivity
- T289, Standard Method of Test for Determining pH of Soil for Use in Corrosion Testing
- T290, Standard Method of Test for Determining Water-Soluble Sulfate Ion Content in Soil
- T291, Standard Method of Test for Determining Water-Soluble Chloride Ion Content in Soil

3. SAMPLING EQUIPMENT

3.1 Scoop, Shovel, or Tube

3.2 Distilled Water

3.3 5 Gallon Plastic Bag

3.3.1 Use of porous sample bags (cloth or woven plastic) is not allowed.

3.4 Plastic Ties

4. SAMPLING

4.1 **Sampling From Approved Sources Covered by QC/QA Program** – Physical requirements will be determined based on routine QC/QA sampling. The Contractor shall have the aggregate

sampled and tested prior to use of the material. Samples shall be obtained by technicians certified as NCDOT Aggregate QC/QA Sampling Technicians or as NCDOT Aggregate QC/QA Sampling and Testing Technicians. Testing for chemical requirements shall be at the following rate:

4.1.1 Submit initial Chemical sample test data to the Materials and Tests Unit's Chemical Testing Engineer and the Project Engineer at least four weeks prior to the proposed use of the material. If results are satisfactory continue sampling and testing in accordance with 4.1.3.

4.1.2 The method and equipment used to obtain the sample will be the same used for obtaining QC Samples as described in the Aggregate QC/QA Program Manual.

4.1.3 Take one 10 lbs. sample every 3000 yd^3 or once per wall whichever occurs more often.

4.1.4 Make sure the large plastic bag is clean and the fine aggregate is not contaminated. Use of porous sample bags (cloth or woven plastic) is not allowed.

4.1.5 Thoroughly clean and then rinse your scoop, shovel, or tube with distilled water prior to taking the sample.

4.1.6 After taking the sample, ensure that you seal the plastic bag with a plastic tie rap (no metal ties)

4.1.7 Submit test data to the Engineer within 14 days of the sample date.

5. GENERAL REQUIREMENTS

5.1 Samples must meet both the chemical and physical requirements before being considered for acceptance.

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6. CHEMICAL REQUIREMENTS

6.1 The fine aggregate shall conform to the chemical requirements in Section 7.3.6.3 of the AASHTO LRFD Bridge Construction Specifications, as shown in Table 1, or Table 2.

Table 1 – Chemical Composition of Aggregate used with Steel Reinforcement and Connectors

	Requirement		
Property	**Min.**	**Max.**	**Test Method**
pH	5	10	AASHTO T289
Resistivity, (Ω·m)	30	--	AASHTO T288
Chlorides , (ppm)	--	100	AASHTO T291
Sulfates, (ppm)	--	200	AASHTO T290

Table 2 – Chemical Composition of Aggregate used with Geogrid Reinforcement and Connectors

Property	Requirement		Test Method
	Min.	Max.	
pH	5	8	AASHTO T289

7. PHYSICAL REQUIREMENTS

7.1 The fine aggregate shall conform to the physical requirements in table 1005-2 and sections 1014 and 1016 of the North Carolina Department of Transportation Standard Specifications for Roads and Structures. Fine aggregate is exempt from mortar strength and siliceous particle content in Subarticles 1014-1(E) and 1014-1(H) of the Standard Specification, as shown in Table 3 and Table 4.

Table 3 – Physical Properties

Property	Requirement		Test Method
	Min.	Max.	
Sodium Sulfate Soundness, 5 cycle weighted average loss, (%)		15	AASTHO T104
Deleterious Substances, (% by weight)		2.0 (natural sand) 1.0 (manufactured sand)	AASHTO T112
Organic Impurities, (%)		1.0	AASHTO T267

Table 4 – Gradation Requirements

STD. Size #	Percentage of Total By Weight Passing							
	3/8"	#4	#8	#16	#30	#50	#100	#200
1S	100	90 - 100		40 – 85		0 – 20		0 – 3
2S	100	95 – 100	80 – 100	45 – 95	25 – 75	5 – 30	0 - 10	0 - 3
2MS		95 – 100	80 – 100	45 - 95	25 - 75	5 – 35	0 -20	0 – 8
4S		100	95 - 100			15 - 45	0 - 10	0 - 5
Class III select material, Type 3	100	95 - 100	65 - 100	35 - 95	15 - 75	5 - 35	0 - 25	0 - 8

8. ACCEPTANCE OF MATERIAL

8.1 The contractor shall furnish the Engineer a Type 4, Certified Test Report for the above materials. The contractor shall have all testing required in 6.1 performed by a Department Approved, AASHTO accredited laboratory. Required documentation for the laboratory shall be submitted by the laboratory four weeks in advance of performing the testing showing they meet these requirements.

9. DEPARTMENT VERIFICATION OF MATERIAL

9.1 The Department will take random samples for verification

9.2 The Resident Engineer shall take verification samples for gradation on the first day of production and at least once per wall. Any wall requiring more than 20,000 tons will require an additional sample.

9.3 Verification Samples will consist of one ten pound bags (for gradation)

9.4 Verification Samples will be taken using the method and equipment as described in the Aggregate QC/QA Program Manual..

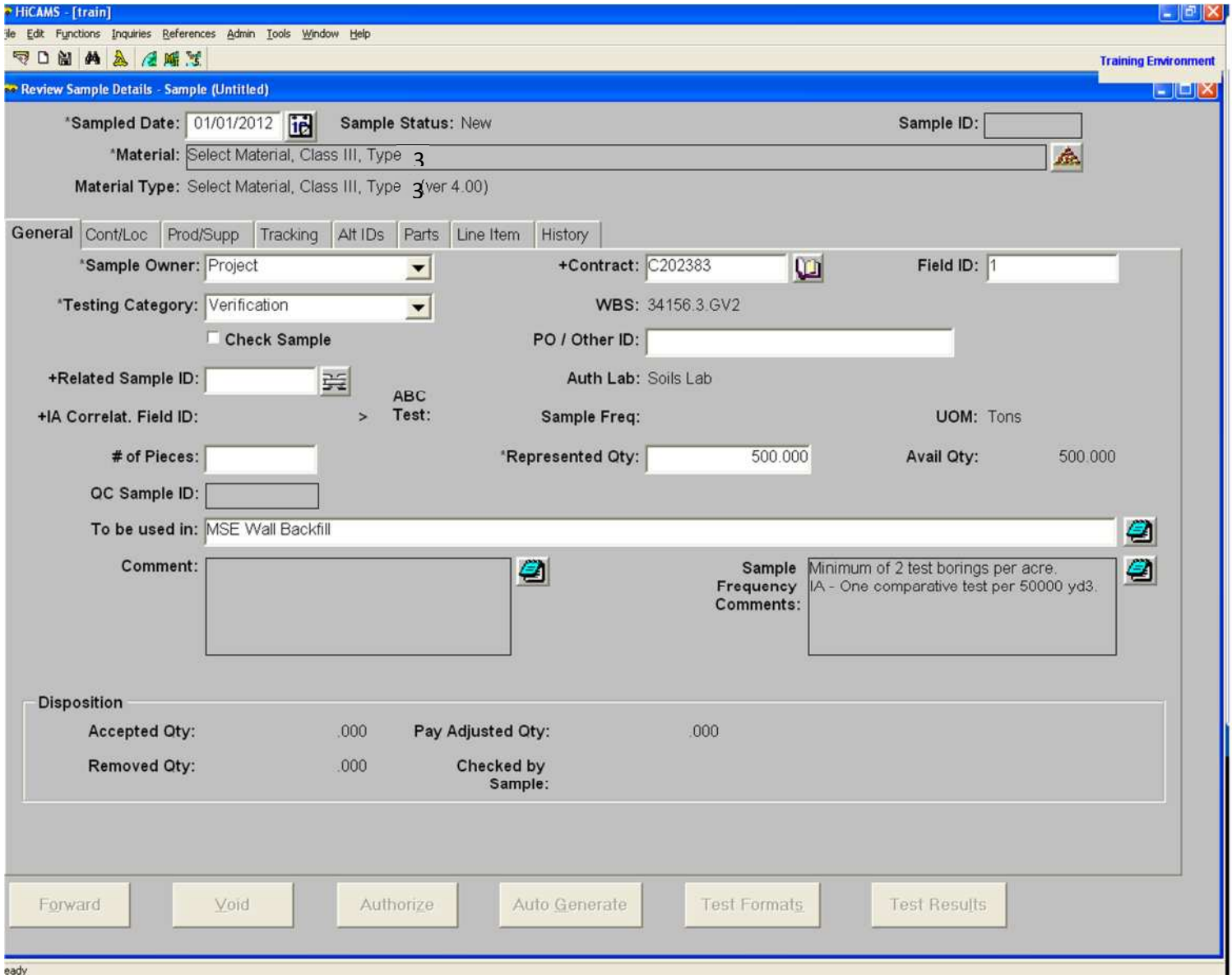
9.5 The Resident Engineer's representative will deliver the bag for testing to the Materials and Tests Unit

9.6 The material shall be entered into HiCAMS under the material type, Class III select material, Type 3 for MSE Walls (See Appendix A).

10. REJECTION

10.1 Samples not meeting specifications will be subject to possible removal and replacement or a pay reduction in accordance with section 105-3 of the Specifications.

Appendix A


HiCAMS - [train]
File Edit Functions Inquiries References Admin Tools Window Help
Training Environment
Review Sample Details - Sample (Untitled)
*Sampled Date: 01/01/2012
Sample Status: New
Sample ID:
*Material: Select Material, Class III, Type 3
Material Type: Select Material, Class III, Type 3 (ver 4.00)
General
Cont/Loc
Prod/Supp
Tracking
Alt IDs
Parts
Line Item
History
*Sample Owner: Project
+Contract: C202383
Field ID: 1
*Testing Category: Verification
WBS: 34156.3.GV2
Check Sample
PO / Other ID:
+Related Sample ID:
Auth Lab: Soils Lab
+IA Correlat. Field ID:
>
ABC Test:
Sample Freq:
UOM: Tons
# of Pieces:
*Represented Qty: 500.000
Avail Qty: 500.000
QC Sample ID:
To be used in: MSE Wall Backfill
Comment:
Sample Frequency Comments: Minimum of 2 test borings per acre.
IA - One comparative test per 50000 yd3.
Disposition
Accepted Qty: .000
Pay Adjusted Qty: .000
Removed Qty: .000
Checked by Sample:
Forward
Void
Authorize
Auto Generate
Test Formats
Test Results
eady